Vol. 31, pp. 9–14 May 16, 1918

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A REVISION OF THE VIVIPAROUS PERCHES.

BY CARL L. HUBBS.

Viviparity has been developed to a high degree of perfection in certain groups of fishes, among the most notable of which are the Viviparous Perches or Surf-fishes of California. These fishes form a compact group, the family Embiotocidae, which is well differentiated from other Percoid types.

The several genera of the Embiotocidae form three groups, here defined as subfamilies, which differ from one another in the structure of the anal fin, and in dentition. In a general view the most primitive of these three groups appears to be the Embiotocinae. This group contains three-fifths of the genera, and includes the forms of unusual range or habitat, such as the two Japanese genera; those species ranging northward to the Puget Sound fauna; the species descending to moderate depths on the continental shelf (*Zalembius rosaceus*), and the only fresh-water representative of the group (*Hysterocarpus traski*). The other species of Embiotocinae inhabit the bays, beaches, and reefs of the Californian faunal region. The Amphistichinae comprise several surf fishes of California, while the Micrometrinae, a specialized offshoot from the Embiotocinae, include only two species, living almost exclusively along the rocky reefs of California.

Most of the genera of the Embiotocidae are now regarded as monotypic. Such an arrangement of the species doubtless expresses very well their isolated position with reference to one another, but as the expression is one of difference and not of resemblance, it might be urged with justice that the more closely related of the genera should be united. As is frequently the

case in similar situations, this "lumping" of the genera, if undertaken, must be extensive, for they form several more or less uninterrupted series. In the following key an attempt has been made to express the natural arrangement of genera forming these series; to compare directly the types most closely related; and to emphasize the isolated position of the more aberrant species. Detailed descriptions of the genera and species with notes on distribution, etc., are given by Jordan and Evermann (Bull. U. S. Nat. Mus., 47, 2, 1898, pp. 1493–1511), and need not be repeated.

ANALYTICAL KEY TO THE GENERA AND SPECIES OF THE EMBIOTOCIDAE.*

A^1.—Anal fin of the male with the same number of fin-rays as that of the female; no oval depression near its base; front of fin enlarged and fleshy; this fleshy portion modified posteriorly into a hard excrescence, followed by a large and prominent, oval, gland-like structure opening anteriorly, the form of which is subject to some variation in the different genera; anal rays variously crowded or elongate in certain areas, none of them enlarged to form a triangular plate. Teeth of the jaws bluntly conic, uniserial . . . . . *Embiotocinae.*

a^1.—"Spinous dorsal longer than the soft part, of 16 to 18 spines; second anal spine the largest"; scales large; lower pharyngeal flat; "vertebrae 14+20=34"; abdomen short; outline of spinous dorsal rounded; body robust; caudal fin lunate; lower lip without frenum; gill-rakers short . . . . . *Hysterocarpus traski* Gibbons.†

a^2.—Spinous dorsal shorter than the soft part; of 8 to 11 spines; anal spines graduated.

b^1.—Scales rather small, more than 55 in the lateral line.

c^1.—"Dentigerous surface of lower pharyngeals flat or concave"; dorsal soft rays not abruptly higher than the spines.

d^1.—Outline of spinous dorsal rounded; the spines stronger; body robust; the caudal peduncle deep; caudal fin lunate.

e^1.—Abdominal vertebrae 14 or 15; abdomen shorter, the anus being located well before middle of body, excluding the head and the caudal fin; anal fin with a longer base.

f^1.—"Lower lip without a frenum, very thick, lobed or incised behind; gill-rakers long; vertebrae 14+22=36"; snout blunter and more massive, even in the embryo . . . . . *Rhacochilus toxotes* Agassiz.

* These portions of the descriptions in quotation marks are extracted from the key used by Jordan and Evermann (Bull. U. S. Nat. Mus., 47. 2, 1898, pp. 1494–1495). All of the species have been reexamined by the writer, and nearly all of the characters mentioned are confirmed, or used now for the first time.

† The fresh-water species; regarded by Jordan and Evermann, and others, as typical of a distinct subfamily, but its relationships with the Embiotocinae (as here outlined) are very close.

f^2.—"Lower lip thin, normal, entire, with a frenum"; gill-rakers short.

g^1.—Posterior rays of anal in male greatly elevated; teeth less bluntly conic . *Ditrema temminckii* Bleeker.*

g^2.—Posterior rays of anal in male not greatly elevated; teeth blunter and coarser . . . . *Embiotoca.*

h^1.—Caudal vertebrae 18 or 19; first haemal spine a little weaker than the second; anal rays III, 24 to 26; colors variable, of both reddish and greenish types . *Embiotoca* (*Embiotoca*) *Jacksoni* Agassiz.

h^2.—Caudal vertebrae 20 to 22; first haemal spine usually less reduced in size; anal rays III, 28 to 31; colors, reddish with blue streaks *Embiotoca* (*Taeniotoca*) *lateralis* Agassiz.

e^2.—Abdominal vertebrae 17 or 18; abdomen long, the anus being located well behind middle of body, excluding the head and the caudal fin; anal fin with an unusually short, oblique, posteriorly inserted base *Hypsurus caryi* (Agassiz).

d^2.—Outline of the spinous dorsal inclined, the spines being graduated, long and slender; body more slender, the caudal peduncle longer; caudal fin deeply forked.

i^1.—Lower jaw with well developed teeth; gill-rakers very short; lower lip with a frenum; caudal vertebrae 23 or 24; first haemal spine large; colors silvery *Phanerodon furcatus* Girard.†

i^2.—Lower jaw with few or no teeth; gill-rakers long and numerous; lower lip without a frenum *Neoditrema ransonnetii* Steindachner.‡

c^2.—Dentigerous surface of lower pharyngeals convex; soft rays of dorsal abruptly higher than the low spines; first haemal spine applied to the second *Damalichthys argyrosomus* (Girard).

b^2.—"Scales large, 36 to 50 in lateral line; soft dorsal and anal shortish; size small."

j^1.—"Lower lip thin, without frenum; gill-rakers long and slender." . *Cymatogaster aggregatus* Gibbons.

j^2.—"Lower lip thin, with a frenum."

---

* *Ditrema laeve* Günther, *Ditrema smitti* Nystrom, and *Ditrema temminckijordani* Franz, all appear to be synonyms of this Japanese species. Should this genus prove inseparable from *Embiotoca*, then the family name should become Ditremidae.

† A second species, *P. atripes*, is recognized. It is taken in comparatively deep water off the California coast, and is supposed to differ from *P. furcatus* chiefly in color, the pelvics being tipped with blackish, the sides of the body being marked with reddish streaks.

Fin-rays in 25 specimens of *P. furcatus* from San Francisco: D. X or XI, 23 to 25 (rarely 26); A. III, 30 to 33 (rarely 29 or 34).

‡ Japanese; not closely related to *Hypocritichthys*, as is currently stated.

k^1.—"Head slender and pointed; gill-rakers rather slender; body rather elongate, not deeply compressed; dorsal rays, VIII, 15"*
Brachyistius frenatus Gill.

k^2.—"Head rather deep and not pointed; gill-rakers thickish; body deep, compressed; dorsal rays X, 18" . . . *Zalembius rosaceus* Jordan and Gilbert.

A^2.—Anal fin of male containing the same number rays as that of female; no oval depression near its base; front of fin without developed glandular structures; the rays crowded anteriorly before a marked angle in the fin, where a ray (about the twelfth) is modified into a large triangular plate (represented in the female by a ray about twice as wide as the others).† Teeth of jaws bluntly conic, in two series (except in the lower jaw of *Hyperprosopon argenteus*)
Amphistichinae, new subfamily.

a^1.—Lower lip attached to chin by a broad frenum; otherwise quite similar to *Holconotus rhodoterus* . . *Amphistichus argenteus* Agassiz.

a^2.—Lower lip without a frenum.

b^1.—Dorsal spine robust; the outline of the fin evenly rounded; the last spines decidedly shorter than the rays of the soft dorsal; interneurals markedly strengthened, the fourth, supporting the first dorsal spine, with prominent lateral keels or wings; gill-rakers rather thicker and shorter, approaching those of *Amphistichus*, 15 or fewer on lower part of arch
Holconotus rhodoterus Agassiz.

b^2.—Dorsal spines rather slender, abruptly graduated to the long middle spines; the last spine scarcely shorter than the soft rays; anterior interneurals not markedly strengthened, the lateral ridges of the fourth low and rounded; gill-rakers long and slender, 17 to 22 below angle.

c^1.—Lower jaw not so strong, little projecting, so that its teeth are nearly apposed to those of the upper jaw, anal fin longer, of 29 to 37 rays . . . . . *Hyperprosopon.*

d^1.—Teeth strictly biserial in both jaws; eye not so much enlarged as in *H. argenteus*
Hyperprosopon (**Tocichthys**)‡ *agassizii* Gill.

d^2.—Inner series of teeth obsolete on sides of lower jaw; eye larger than in any other species of the family
Hyperprosopon (*Hyperprosopon*) *argenteus* Gibbons.§

c^2.—Lower jaw very strong, projecting forward beyond the upper at the symphysis, so that the teeth of the two jaws are not nearly apposed; anal fin shorter, with about 23 rays
Hypocritichthys analis (A. Agassiz).

* Dorsal VIII or IX, 11 to 13; anal III, 20 to 22 (three specimens examined).

† This is one of those interesting cases in which a secondary sexual character is not confined wholly to its proper sex.

‡ *Tocichthys*, new subgenus (subgenotype, *Hyperprosopon agassizii* Gill). Anal rays in *H. agassizii*, III, 30 to 33 (six specimens).

§ Anal rays in 31 specimens from central California, III, 30 to 35 (37 in one).

A^3.—Anal fin of male containing more rays than that of female;* a large oval depression with a well-defined rim, on body near front of anal fin; the skin thickened in this depression, and the sheaths about cylindrical muscles lying beneath the skin bound to it;† an oval gland-like body with an anterior horn developed on each side of fin, connected with other structures as in the Embiotocinae; anal rays crowded anteriorly, but none modified into a triangular plate. Teeth of the jaws tricuspid, uniserial; intestine longer than in other groups; the two species herbivorous **Micrometrinae,** new subfamily.

a^1.—Scales over oval depression near front of anal fin in male minute; scales also decreased in size in the corresponding area in the female; scales, 43 to 47 (53 in one specimen) along lateral line; difference in the number of soft rays in the anal fin of the two sexes less (18 to 20 in the female; 21 to 23 in the male);‡ dorsal rays VIII (sometimes VII or IX), 17 to 19;‡ the first three spines abruptly graduated, the last five subequal; outlines of body subelliptical **Amphigonopterus** § *aurora* (Jordan and Gilbert).

a^2.—Scales over oval depression near front of anal fin in male rather less reduced in size; scales, 34 to 42 (47 in one specimen); difference in the number of soft rays in the anal fin in the two sexes somewhat greater (13 to 18 in the female; 20 to 23 in the male);‖ dorsal rays IX or X (rarely VIII), 12 to 15;‖ the median spines strengthened and elevated; outlines of body subrhomboidal *Micrometrus*¶ *minimus* (Gibbons).

---

*But one other instance of this kind in the whole class of fishes has come to the writer's attention: it is that of the South American Poecilioid genus *Cynolebias* (see Regan, Ann. Mag. Nat. Hist., ser. 8, 10, 1912, pp. 641–642).

† No gland was found beneath this depressson by gross dissection.

‡ About 90 specimens counted.

§ *Amphigonopterus*, new genus; genotype, *Abeona aurora* Jordan and Gilbert, a species inhabiting the rock-pools of the central California coast.

‖ About 90 specimens counted; the variation is extraordinarily wide for a spiny-rayed fish.

¶ Concerning the use of *Micrometrus* Gibbons, in place of *Abeona* Girard, see Jordan (Copeia, No. 49, 1917, p. 86).